In the Claims:

Please rewrite claims 3-6, 9, 19-28, 30-32, 35, 40, 43-48, 50-51, 53-55, 57, 59, 61-65, 67-68, 72-75, 79, 82-83, 86, 89-98, 101-102, 104-108 and 112.

3. (Amended) A grating as claimed in claim 2, which comprises at least 5 grating elements.

A1

4. (Amended) A grating as claimed in claim 3, which comprises at least 20 grating elements.

5. (Amended) A grating as claimed in claim 1, comprising material which has no, or a negligible, real component or no, or a negligible, imaginary component.

6. (Amended) A grating as claimed in claim 1, in which the selected response characteristic is a spectral amplitude response and the characteristic length is a spectral amplitude cut-off wavelength.

A2

9. (Amended) A grating as claimed in claim 7, in which the band gap is a photonic band gap.

19. (Amended) A grating as claimed in claim 1, having a spectral phase response which is linear.

20. (Amended) A grating as claimed in claim 1, having a spectral phase response which is nonlinear.

21. (Amended) A grating as claimed in claim 1, which is suitable for phase compensation.

A3

22. (Amended) A grating as claimed in claim 1, which is suitable for single-frequency dispersion compensation.

23. (Amended) A grating as claimed in claim 1, which is suitable for a multiple-frequency dispersion compensation.

24. (Amended) A grating as claimed in claim 6, in which the spectral amplitude response comprises a combination of the response characteristics claimed in claim 6.

25. (Amended) A grating as claimed in claim 1, in which the aperiodic grating structure is 2-dimensional.

26. (Amended) A grating as claimed in claim 1, in which the aperiodic grating structure is 3-dimensional.

Cont A3

27. (Amended) A filter comprising a grating as claimed in claim 1.

28. (Amended) A dielectric stack, comprising a grating as claimed in claim 1.

30. (Amended) A dielectric stack as claimed in claim 28, comprising two kinds of layers differing in refractive index.

A4

31. (Amended) A dielectric stack as claimed in claim 28, which comprises layers, at least three of which have refractive indices which are different from each other.

32. (Amended) An optical fibre Bragg-grating, comprising a grating as claimed in claim 1.

A5

35. (Amended) A waveguide structure comprising a grating as claimed in claim 1.

A6

40. (Amended) A waveguide structure as claimed in claim 35, which is a dynamic and/or reconfigurable structure, wherein the grating is arranged so that the magnitude of the relevant parameter may be altered at least one point in the grating.

A7

43. (Amended) A waveguide structure as claimed in claim 41, in which the effect is effected by inter-digitated electrodes.

44. (Amended) A waveguide structure as claimed in claim 41, in which the effect is effected by a comb-like electrode.

45. (Amended) A waveguide according to claim 35, in which the grating is along the length of the waveguide.

46. (Amended) A waveguide according to claim 35, in which the grating is within the waveguiding region.

47. (Amended) A waveguide structure according to claim 35, in which the waveguide chosen from the group consisting of an optical fibre, a microwave strip line, a silica on silicon planar lightwave circuit (PLC), a silicon on silica PLC, a semiconductor amplifier, and a semiconductor laser.

Cont A7

48. (Amended) A grating as claimed in claim 1, in which structure is in the material permittivity.

50. (Amended) A grating as claimed in claim 1, in which structure is in the material permeability.

A8

51. (Amended) A grating as claimed in claim 1, in which structure is in the a magnetic property.

53. (Amended) An aperiodically-poled non-linear material, comprising a grating as claimed in claim 1, which is employed to quasi-phase-match light at two or more wavelengths.

A9

54. (Amended) An aperiodically-poled non-linear material, comprising a grating as claimed in claim 1, which is

employed to suppress light at one or more wavelength.

Cont

#9

55. (Amended) A non-linear optical loop mirror including a non-linear material as claimed in claim 53.

#10

57. (Amended) A non-linear optical loop mirror including a grating according to claim 1.

#11

59. (Amended) A Mach-Zehnder interferometer including a grating according to claim 1.

61. (Amended) A Mach-Zehnder interferometer as claimed in claim 59, including an aperiodically-poled non-linear material.

#12

62. (Amended) A Mach-Zehnder interferometer as claimed in claim 59, including a waveguide structure as claimed in claim 35.

63. (Amended) A Mach-Zehnder interferometer as claimed claim 59, in which the grating is written onto an integrated-optic waveguide.

64. (Amended) A grating-assisted coupler including a grating according to claim 1.

Cont A12

65. (Amended) A grating-assisted coupler as claimed in claim 64, which is bidirectional.

67. (Amended) A grating-assisted coupler as claimed in claim 64, including an aperiodically-poled non-linear material as claimed in claim 53.

A13

68. (Amended) A laser, including a grating according to claim 1.

72. (Amended) A laser according to claim 68, which is pulsed.

A14

73. (amended) A laser according to claim 68, which can be modelocked.

74. (Amended) A laser according to claim 68, which is a ring laser.

Cont

A14

75. (Amended) A laser according to claim 68, which is a semiconductor laser.

A15

79. (Amended) A Fabry-Perot cavity, comprising at least one end mirror comprising a grating according to claim 1.

A16

82. (Amended) A material including a grating as claimed in claim 1, in which the grating modifies an electronic bandgap structure.

83. (Amended) A material including a grating as claimed in claim 1, in which electronic potential has a variation controlling the selected response characteristic.

A17

86. (Amended) A material as claimed in claim 84, in which the scatterers are positioned at the vertices of a lattice or superlattice.

A18

89. (Amended) A material as claimed in claim 82, in which the selected response characteristic is a band

minimum.

90. (Amended) A material as claimed in claim 82, in which the selected response characteristic is an effective mass.

91. (Amended) A material as claimed in claim 82, in which the selected response characteristic is a thermal conductivity.

92. (Amended) A material as claimed in claim 82, in which the selected response characteristic is a dielectric permittivity.

93. (Amended) A material as claimed in claim 82, in which the selected response characteristic is a conductivity.

94. (Amended) A material as claimed in claim 82, in which the selected response characteristic is a magnetic permeability.

95. (Amended) A material as claimed in claim 82, which is a superconducting material.

96. (Amended) A grating as claimed in claim 1, which is in or on a nonlinear medium and which enhances a nonlinear effect.

Cont A18

97. (Amended) A grating as claimed in claim 1, which is in or on a nonlinear medium and in which the selected response characteristic is phase matching between at least two wavelengths and the characteristic length is an optical path length as measured in air, of $2\pi/\delta\beta$ where $\delta\beta$ is the difference between the propagation constant of two of the phase matched wavelengths.

98. (Amended) Use of a grating according to claim 96, in any of the following applications: wavelength conversion, signal re-timing, signal regeneration, parametric amplification, applications involving second- and third-order nonlinear effects, or parametric oscillators.

A19

101. (Amended) A method as claimed in claim 99, in

which the elements of the grating are directly and individually varied.

Cont A19

102. (Amended) A method according to claim 99, in which the response characteristic of the grating is taken during optimization to be approximately, or is derived from, the Fourier Transform of the grating arrangement during optimization.

104. (Amended) A method according to claim 99, in which the Fourier Transform of the grating arrangement is evaluated during optimization to see if, or how, it differs from the selected response characteristic.

A20

105. (Amended) A method as claimed in claim 99, in which the optimization algorithm is simulated annealing.

106. (Amended) A method as claimed in claim 99, in which the optimization algorithm is error-diffusion.

107. (Amended) A longitudinal grating made using a method according to claim 99.

Cont
A20

108. (Amended) A longitudinal grating which could be made using a method according to claim 99.

A21

112. (Amended) A longitudinal grating, comprising a plurality of concatenated gratings as claimed in claim 1.